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Research Article

Community Governance for Small Modular Reactor (SMR) Development: Lessons from Northern and Indigenous Energy Projects

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Abstract: Remote Indigenous communities in northern Canada often suffer from energy insecurity and energy poverty. In developing local clean energy production, there is an obvious benefit for government and industry partnering with these communities. However, the record of these partnerships is poor, with some failing to produce the expected benefits and others failing to get off the ground at all. This article is based on a study of four case studies of renewable energy projects in Indigenous communities in northern Saskatchewan and Alberta, in which I interviewed community project leaders to understand why these communities were interested in energy projects, what they hoped to achieve, and their experience with their partners. I also interviewed government and industry partners. While the results underline the importance of Indigenous intermediaries who can move easily between the communities and the larger energy production context, they also reveal a fundamental misalignment of expectations between Indigenous communities and their partners. Recent discussions about the potential for small modular nuclear reactors (SMRs) in remote communities have generally focused on features of the technology rather than on aspects of the social context of Indigenous communities. I argue that, for communities to fully understand the advantages and drawbacks of this technology, much more attention needs to be paid to the construction of a safe space where communities can frame the discussion within Indigenous world views and lived experience. I offer some policy suggestions for how this space can be constructed and protected.

1. Introduction

Northern, remote, Indigenous communities are among the most vulnerable to the impacts of climate change (Furgal & Seguin, 2006; NCCIH, 2022; Peace & Myers; Prowse et al., 2009; UNDESA, 2008). This risk drives the need for both enhanced energy security and an accelerated energy transition for those communities. Sustainability transitions (ST) theories have proposed a number of transformation processes through which established socio-technical systems shift to more sustainable modes of production and consumption (Geels, 2011; Kivimaa & Virkamäki, 2014; Köhler et al., 2019; Markard et al., 2020; Smith et al., 2010). Sustainable energy transition is fundamental for northern, remote, and Indigenous communities (Doyon et al., 2021; Hoicka et al., 2021; Karanasios & Parker, 2018); however, the majority of ST theories are based on Eurocentric approaches, where Indigenous communities are largely absent (Iakovleva et al., 2021). And while there is literature on just energy transitions for Indigenous Peoples, there is no existing framework for what the unique sustainability transition and engagement process for Indigenous communities could look like (UN, 2021).

Indigenous communities historically have unique perspectives on sustainability that are different from the Eurocentric approaches found in the sustainability transitions literature (Kouril, 2015; Sheridan & Longboat, 2006; Throsby & Petetskaya, 2016; Tom et al., 2019; Virtanen et al., 2020). With the accelerated development of technology and innovation, many Indigenous nations see value in engaging in the global goal of energy transition, but they want to do it on their terms (Hoicka et al., 2021; Savic & Hoicka, 2021). So the question is, can clean-energy transition acceleration, which is part of global plans in addressing climate change, align with Indigenous nations' world views and their views on sustainable energy transition?

To deploy innovative clean energy technology in Canada, either renewables or small modular reactors (SMR), developers are required to fulfill their duty to consult and accommodate with potentially impacted Indigenous communities (CIRNAC, n.d.). These requirements are a well-known feature of the constitutionally protected rights of Indigenous Peoples in Canada, and there is no suggestion that the proponents of SMRs fail to understand this or will try to evade their obligations. But the hypothesis is that there is a disconnect between the perspectives of Indigenous communities and those of governments and industry regarding the sustainability transition. Traditional sustainability transitions theories (Geels, 2011; Kivimaa & Virkamäki, 2014; Köhler et al., 2019; Markard et al., 2020; Smith et al., 2010) are more centred around enabling technological development, while social factors are used mainly to explain those technological

changes. However, recent research shifts that focus towards the combination of the technical and social, where factors like institutions, culture, and behavioural patterns play a more prominent role as drivers of change (Holtzet al., 2008). I acknowledge these developments as helpful in understanding how Indigenous communities can take part in and even initiate transitions. Indigenous governance becomes part of the broader socio-technical regime that confronts an innovation like an SMR and helps determine its prospects, but we should not lose sight of the possibility that Indigenous communities can also be places for niche innovation. Thus, in this study I consider socio-technical regimes as complex systems that perform societal functions.

In many cases, the challenge of energy transitions, apart from the capacity building of Indigenous nations, is about linking the skills and tools that now exist, or can be potentially accumulated within communities and nations, with the requirements of government and industry. Energy transition for communities involves getting into something far more technical, such that they benefit from an intermediary who can provide guidance and support in every stage of the project development process (Iakovleva & Rayner, 2023).

Thus, the goal of this research was to study community governance of energy projects and investigate the role of intermediaries in energy transitions. The article provides recommendations that include the vision of northern, remote, and Indigenous communities in sustainable energy transitions. This work is part of a larger project on SMRs (which currently only exist as demonstration projects), and is based on the lessons learned from clean energy technologies in sustainability transitions case studies (Iakovleva et al., 2021). This may be relevant for SMR development and the role of intermediaries (agents or brokers between parties in the innovation process) and storylines in SMR development (Iakovleva & Rayner, 2023).

In section 2, I briefly review the literature on sustainability transitions and community governance, including previous work on the lessons of other clean-energy technologies that may be relevant for SMRs and for the role of intermediaries and storylines around SMRs. In section 3, I describe the research methodology, and section 4 provides an overview of four case studies of community energy projects in northern Saskatchewan and Alberta. In section 5, I look at the themes that emerged from interviews with community members, while in section 6 I investigate government/industry perspectives. Then in section 7 I analyze those perspectives to see whether there is an alignment and/or a discrepancy between them. Section 8 provides brief policy recommendations based on the results, and section 9 concludes the article.

2. Background

In Canada, the energy transition is for the most part driven by the federal and provincial governments and by the energy industry, with provincial utilities (such as publicly owned or Crown corporations providing electricity) supporting the development of innovative technologies. Discussion of appropriate technologies focusing on community energy needs is limited (Hargreaves et al., 2013; Seyfanget al., 2014; Smith et al., 2016). The rapid and fairly recent development of small nuclear modular reactors in Canada (SMR), provides a good example of this disconnect and its potential consequences.

SMRs can be defined either as “small modular reactors” or as “small and medium-sized reactors” according to the International Atomic Energy Agency (IAEA, 2020). The power output for a small reactor is up to 300 MWe (megawatt of electricity), and for a medium reactor it is between 300 and 700 MWe. Modular means that the reactors are assembled from different modules, where each module is part of a finished plant, not constructed on-site (Ingersoll, 2015; Sovacool & Ramana, 2015). Small nuclear reactors have been around for several decades. Ingersoll (2015) argues that “they are neither new to the nuclear industry nor represent a whole new technology” (Ingersoll, 2015, p. 3). However, their design features intend to offer an energy option to those customers for whom large nuclear plants are not a viable choice.

Micro modular reactors (producing less than 5 MWe) are specifically proposed for remote communities and resource extraction projects in order to reduce dependency on diesel-generated energy and, in the case of communities, to gain economic independence. Larger SMRs (up to 300 MWe) are generally of direct interest to provincially owned utility companies to offset the use of fossil fuels and reach net-zero emissions goals. With this, the proximity of Indigenous communities and their traditional lands will be important factors in siting and operations.

There is a proposed timeline for deployment based on technology and regulatory readiness levels. Conventional designs and advanced designs with fewer innovative features are expected to be demonstrated and commercialized before 2030, while more innovative SMRs may not be commercialized until later in the 2030s. Thus, nuclear energy experts identify phase 1 and phase 2 for SMR deployment (NEA, 2023). Saskatchewan and Alberta are signatories of a Memorandum of Understanding that also includes the provinces of New Brunswick and Ontario (Government of Saskatchewan, 2022). Saskatchewan selected a 300 MWe water-cooled, natural circulation SMR to be built and integrated into the grid. Alberta has not made any plans yet, but in January 2024

advanced with Capital Power Corporation, a publicly-traded Alberta electrical utility, signing an agreement with Ontario Power Generation (OPG) to jointly assess the development and deployment of grid-scale SMRs in Alberta.

These developments are intended to provide clean, reliable energy for the provinces, yet they are predominantly driven by global actors, government, and industry to achieve clean energy goals, rather than by the visions that northern communities have for their own energy futures.

3. Theoretical Framework and Method

3.1. Theoretical Framework

There is much literature that investigates the socio-cultural implications of the transition to renewable energies in Indigenous communities, particularly off-grid diesel powered communities in Canada (Bledsoe, 2022; Cook, 2019; Hoicka et al., 2021; Karanasios, 2018; Savic & Hoicka, 2021; St. Denis & Parker, 2009). However, limited research has been conducted on community-informed approaches that are embedded in a broader societal transition, especially those with application to SMRs.

This study takes a sustainability transitions approach (informed by Indigenous economic development and intermediaries), specifically the Multi-Level Perspective (MLP) that focuses on the problem of taking innovative technologies from the protected “niche” environments they inhabit during research and development, and supporting their large-scale adoption in more competitive environments that are often dominated by incumbent technologies and institutions hostile to innovation (El Bilali, 2019; Geels, 2011; Markard & Truffer, 2008). This is important in understanding the development of innovative technology with potential application to northern, remote, and Indigenous communities. As such, this approach helps to understand similarities and differences between renewable energy technology and SMR development. Renewable technologies—solar photovoltaic, small-scale hydro, and biomass—had all broken out of their original niches and achieved broad social acceptance by the time the Indigenous communities in these case studies came to consider them. The challenge for the proponents was to have them adopted in a new context—remote, Indigenous communities—that posed additional challenges which, I will argue, were not well understood by proponents because of a failure to listen carefully to what their community partners were telling them.

SMRs, on the other hand, are still very much a “niche” protected-space technology, and proponents will have to surmount the double challenge of empowering an unfamiliar technology in an unfamiliar context, a case in which the technology stands very little chance of serious consideration unless the

community context receives more careful attention. This research demonstrates that the renewable energy projects now under development in Indigenous communities in northern Saskatchewan and Alberta are mostly embraced by the communities, and are closer to the world views of those communities than other energy technologies. Thus, they present a good learning case for SMRs.

I also draw on the concept of intermediaries in the sustainability transitions literature, defined as “organization(s) or bod(ies) that act [as] an agent or broker in any aspect of the innovation process between two or more parties” (Howells, 2006). Intermediary actors and networks are the key agents that develop and spread the discourses that seek to empower technologies in their quest to escape the niche and survive and prosper in the broader regime (Sovacool et al., 2020; Stewart & Hyysalo, 2008; van Lente et al., 2020). However, there is the role of power and politics in the governance of socio-technical transitions (Iakovleva et al., 2021). Community governance, as this research demonstrates, is a broader concept than the traditional understanding of governance (Totikidis et al., 2005); in this research it includes traditional government (Band Councils, First Nations, Tribal Councils as set by the federal Indian Act), and governance of energy projects that include multiple actors and governance instruments. As such, institutionally privileged actors are able to make more forceful changes to multi-level dynamics compared to many others that play a less strategic role (Geels, 2004; Smith et al., 2005). I emphasize that SMRs cannot be adopted unless political obstacles are systematically addressed, which requires intermediaries to help guide the process by linking actors, activities, skills, and resources (Iakovleva & Rayner, 2023).

Therefore, I investigate the governance and development of the case study community energy projects and the role of intermediaries, to help provide a comprehensive understanding of their role and placement in the socio-technical regime.

3.2 Research Question and Method

This research is qualitative and uses methods of secondary data analysis, semi-structured interviews, and case studies. First, I conducted secondary data analysis of public documents from government agencies, utility companies, intermediary organizations, SMR vendors, communities of identified case study projects, and websites of relevant First Nations, Tribal Councils, and relevant Indigenous organizations. After that, between May 2022 and January 2023, I conducted twenty-one interviews with representatives from government, industry, and communities, including policy-makers, community project leaders, utility companies, SMR vendors, and intermediaries concerned with energy futures. I then made a verbatim transcript of the interview. Interview subjects were identified according to a

classification based on their organization: seven respondents came from industry (five utilities, one vendor, and one other); six from intermediary organizations (three advocacy organizations and three brokers); seven from community organizations; and one from academia. The community project interviews were with project leaders and representatives (Indigenous and non-Indigenous), which included two people for each case study except for the Tazi Twé project, where there was only one community representative. The project had been shelved a while ago and it was challenging to find multiple representatives for the project; however, I interviewed utility representatives who directly worked with the project development at the time. To test the hypothesis for analysis, the interview data was divided into a government/industry category and a community category. This was done to differentiate federal, provincial government, and industry perspectives from the community perspectives, and to represent or reflect the authentic voice of the communities via or through community project representatives.

Each transcript was coded with NVivo software using thematic analysis, which identifies and interprets patterns in a data set (Braun & Clarke, 2006; Liebenberget al., 2020; Xu & Zammit, 2020); these patterns were found from interpreting keywords used by respondents. Identified themes were coded as nodes, which helped me to establish a set of codes that were applied to further categorize data. After that, I linked the recurring themes together as sub-nodes under one overarching node. To validate, I conducted a second revision of the data. This helped me to build a revised set of codes for the themes that emerged from industry/government and community projects' perspectives.

Based on the hypothesis that there is a disconnect between perspectives of Indigenous communities and those of government and industry perspectives on the sustainability transition. I studied community projects' governance to find a way to reconcile these perspectives, and to create a community-informed policy environment for innovative technology implementation that would contribute to the sustainability transition. This led to my research questions:

1. How can insights provided from sustainability transition case study lessons help us understand the community governance of energy projects in sustainable energy transitions for innovative technology, thus, create a policy environment for innovative technology adoption in northern, remote, and Indigenous areas?
2. Based on the experience of the community energy projects, what are the policy recommendations for innovative technology adoption in northern and Indigenous areas, for potential application for SMR projects?

To answer these questions, I studied innovative energy technology case studies from a community governance lens, then I applied the same lens to

the industry and government representatives' data to learn whether there is an alignment or discrepancy. This research takes a generalized approach to innovative technologies by including renewable energy and SMRs in the category of clean energy technology.

4. Community Projects

The four selected case studies involve innovative energy technologies, particularly renewable energy projects, that are driven and led by northern and Indigenous communities in northern Saskatchewan or Alberta. They are examples of Indigenous-owned and led projects that create a difference in their communities, including energy security, carbon emissions offset, infrastructure improvement, and investment opportunities. Two of the case studies represent a single community initiative, while the other two are a group initiative of the community. Case studies were selected based on the technology the project employed: biomass, hydro, or solar in on-grid and remote off-grid communities, as well as the location of each project. The selected projects also include examples of both successful and unsuccessful projects.

4.1. Meadow Lake Tribal Council Biomass Project

Meadow Lake Tribal Council (MLTC) is comprised of nine First Nations in northwestern Saskatchewan (Canoe Lake, Flying Dust, Island Lake, Makwa Sahgaiehan, Waterhen Lake, Birch Narrows, Buffalo River, Clearwater River, and English River), with a population of about 16,000 people living on and off reserves. Like many rural First Nations, most of those in the MLTC have limited opportunities for economic development, so the main goal for the Meadow Lake Tribal Council Bioenergy Centre project was to generate revenue to fund their operations, services, and programs by providing clean energy from waste. Forestry is important in northwestern Saskatchewan, though harsh conditions and distance from markets puts limitations on the development of the industry. MLTC invested in two sawmills: one in Meadow Lake, and most recently one in Glaslyn designed for more intensive utilization of timber, including the production of posts, rails, and wood residues (biomass). The Glaslyn mill is now a 100% Indigenous-owned facility recycling waste from three existing mills in the area.

In 2018 MLTC secured \$52.5 million from the Canadian government's green infrastructure program to support the biomass project, and made a 6.6 MW (megawatt) power purchase agreement (PPA) with SaskPower, the provincial electrical utility. While the government provided funding, MLTC looked after the planning, operations, and development, choosing self-management over contracting externally. To receive federal funding for the project, MLTC

had to create a slightly complex management structure involving a not-for-profit corporation that returns dividends for distribution to MLTC Resource Development Inc. (RDI), an entity governed by a board comprised of the Chiefs of the nine First Nations, the Chief of the Tribal Council, and two external members.

4.2. Fort Chipewyan Solar Project

Fort Chipewyan is a remote community in northern Alberta with a population of approximately 1,200 people. The Fort Chipewyan Solar Project is the first and largest off-grid solar farm in Canada (Government of Alberta, n.d.). For the community, solar was seen as the most viable option to offset the use of diesel generators without investing in expensive infrastructure. With the help of ATCO, a publicly traded company providing natural gas and electricity in Alberta, Three Nations Energy (3NE) was created. It is owned collaboratively by Athabasca Chipewyan First Nation (ACFN), Mikisew Cree First Nation, and Fort Chipewyan Métis Nation. The 3NE Board of Directors consists of two representatives from each co-owner (Three Nations Energy, 2023).

In this case, 3NE invited Greenplanet Energy Analytics, an Alberta-based clean energy company, to help design, manage, and build the solar farm. The result is a total of 2.95 MW of capacity, comprising 2.35 MW owned by 3NE and 600 kW owned by ATCO. The entire cost of the project was about \$7.7 million, with \$4.5 million provided by Natural Resources Canada and the rest by the Government of Alberta, which also provided funding for the original Community Energy Plan.

The solar farm was built to offset diesel emissions (25% annually) and to provide additional support to the local grid. It was also intended to give the community a greater stake in their own energy system. 3NE owns the solar farm and sells the electricity under the provincial small-scale generation regulations, or SSGR—85% of revenue is divided equally amongst the three owners, and 15% is held for energy education and stewardship. However, 85% is approximately \$50,000 to \$70,000 a year, which is insufficient for social, educational, and other community programs.

Unlike Saskatchewan, Alberta has a partially privatized energy market so 3NE sells to the Alberta Electric System Operator (AESO), while ATCO manages the local grid. ATCO also has a maintenance and service contract and operates a battery storage for the solar project, which is connected to a 6 MW solar farm of their own. They are responsible for ensuring that the solar farm is maintained and operated in a way that integrates with their larger system. The three Indigenous nation co-owners agreed on ownership, percentage, and project

share percentage, and 3NE spent several months increasing the comfort level of the Fort Chipewyan community with the idea of building and owning a solar project in collaboration with ATCO.

4.3. Tazi Twé Hydroelectric Project

Black Lake Denesuline First Nation (Black Lake), with a population of about 2,000, is located in the far north of Saskatchewan, one of the twelve members of the Prince Albert Grand Council. A peculiarity of the Saskatchewan power grid is the existence of a separate northern grid based on hydro power with connections to Manitoba but not to the rest of Saskatchewan. The Black Lake First Nation proposed increasing capacity on the northern grid with Tazi Twé, a run-of-the-river (i.e., using the natural downward flow of river) 50 MW hydroelectric project. Lacking experience with large-scale infrastructure projects, Black Lake turned to the Prince Albert Development Corporation (PADC), the economic development arm of the Prince Albert Grand Council, and to SaskPower as a partner.

The deal offered by SaskPower, the Crown corporation electric utility, included a 49% ownership interest for the First Nation with a 50/50 revenue split. Unlike the situation in Alberta, SaskPower is the sole power purchaser in Saskatchewan and would have been simultaneously a purchaser and a business partner. They were naturally interested in buying the power at the cheapest rate possible, while the First Nation's interest lay in maximizing revenue. The environmental impact assessment process for the project took over three years, during which time the estimated cost of the project inevitably increased while the main customer for the electricity, the northern Saskatchewan uranium mines, entered a prolonged period of low prices, resulting in mine closures and reduced demand.

In the end, the project was postponed. Thus, this project represents a case of failure, indicating not just how regulatory hurdles can affect community energy projects, but also the challenge of working with a monopoly power purchaser. Nevertheless, working with SaskPower created the opportunity to develop a number of energy efficiency projects in the community.

4.4. Muskoday Solar Projects

Muskoday Solar Projects are developed by Muskoday First Nation, a member of the Saskatoon Tribal Council. Band membership is approximately 2,200, of which about 780 live in the community, which is located in the area covered by the main, southern section of the Saskatchewan power grid. There are two solar projects overseen by the First Nation's economic development arm, the Muskoday Economic Development Authority (MEDA) (Muskoday First Nation, 2023). The first, in 2017, was a small community development project to provide solar panels for three community buildings, funded in part by the federal government's

Low Carbon Economy Challenge. Muskoday First Nation applied for \$500,000 but received only \$375,000 in funding from the federal program, financing the balance themselves. The second project was intended to generate revenue from selling power to the grid under a power purchasing agreement with SaskPower. Originally proposed as a 1 MW project, it was eventually reduced to 324 kW because of funding difficulties and the risks of financing agreements. Though the amounts may appear small, the project received only \$250,000 from the federal government and would have been required to generate close to capacity in order to finance larger bank loans, a risky proposition with solar power.

Planning and support for the project was provided by the First Nations Power Authority (FNPA)—an intermediary Indigenous non-for-profit development company that helps build clean energy projects in Indigenous communities—and the Muskoday Economic Development Authority. MEDA's Board of Directors consists of seven members, four Muskoday First Nation members and three independent members. Grants were essential to the feasibility of the projects. They were never sufficient to cover all the costs, however, and they involved the same circuitous process observed at Meadow Lake; MEDA prepared the application, and the Muskoday First Nation formally applied for the grant and then turned the money over to MEDA. Like Meadow Lake, both Muskoday and Tazi Twé ended up with a more top-down approach in contrast to the more bottom-up governance found at Fort Chipewyan.

5. Key Themes from the Community Interviews

The themes identified from the interviews with community representatives reveal high-level goals such as economic self-sufficiency and sustainability, while process, recognition, and capacity building are seen as the main challenges and opportunities that need to align with Indigenous world views.

5.1 High-Level Goals: Economic Self-Sufficiency and Sustainability

For all those interviewed, one of the main goals of energy projects was to generate revenue to fund programs and services. The nations want to become self-sustaining; the interviewees emphasized that they “don't want control through ‘handouts’” (community interviewee #1). The other goal is to reduce greenhouse gas emissions and gain energy security by creating clean energy projects that also align with the interviewees' Indigenous perspective of respecting the land. The findings show that escaping dependence is the main driver behind the nations' development of renewable energy projects. The interviewees admitted that federal transfers are not enough, so communities still face a lack of funding for community programs and services. Therefore, the communities in these case studies look for projects that can help gain self-sufficiency, but which also align with their Indigenous world views.

5.2 Challenges and Opportunities: Process, Recognition, and Capacity Building

The community leaders, as well as the government and industry respondents, agree there is need for a better process when it comes to the planning and implementation of energy projects. Interestingly, community leaders see the pre-planning phase as the most difficult. Funding is certainly a challenge, but their frustrations revolved around the failure of government and industry to see Indigenous communities as equal partners, and to ensure that the communities have the decision-making space and capacity to turn that equal vision into reality:

you have to build capacity from within and do your research properly. But I think there needs to be more willingness by government and by Crown corporations to walk down that road together. It's in everybody's interest ... (community interviewee #5)

Achieving equality in part requires a change of attitude but, as community respondents expressed, that change comes with a responsibility to rethink what true partnership involves.

For these community leaders, the future of their communities is tied up with the planning process and funding in complex ways. For communities it seems like a one-sided approach that they need to come up with proposals, make inquiries, and go to a power utility. When it comes to who has more influence in decision making, the communities argue that it is “those who can control the purse strings at [the] provincial and SaskPower level” (community interviewee #5). Whether the utility is public or private, the concerns are similar: “In Saskatchewan, we're limited to one purchaser, so they pretty much hold the cheque book” (community interviewee #1). SaskPower has negotiating power and control in a number of aspects, as a respondent said: “you have a group there, that's a gatekeeper” (community interviewee #1). This is equally applicable to the Alberta case where ATCO and AESO are seen as the main decision makers.

This broad perception of inequality is supported by two specific areas where community leaders mentioned capacity deficits. The first is funding in a context where the partner sets up high expectations in project development that requires sufficient capital funding: “Any kind of project that's going to generate sufficient energy that's worth selling back to SaskPower is going to be costly” (community interviewee #5). Therefore, all the community representatives emphasized the difficulty in raising the finances for starting the project and the time that it will take to recoup the investment.

Global and Canadian climate change policies have created a window of opportunity for Indigenous nations and for government to find energy options that do not require much capital cost but are efficient in combating climate change. So,

the federal government started to develop clean energy grants and funding that became, in most cases, the only way for First Nations to develop their renewable projects. Even then, when part of a project needed to be financially covered by the Indigenous nations, they encountered many difficulties. The revenue for all projects was modest so the projects could not have proceeded without grants. Indigenous groups in some of the case studies were able to successfully secure parts of their funding from the federal government and another part from a commercial bank. In the case studies, interviewees emphasized that the projects were not considered profitable from an investment perspective. They argued that power purchase agreements are not lucrative, but they are a stable revenue model.

The challenge posed by rising interest rates is that the same revenue could be generated from investment rather than capital expenditure. While this might not seem like a problem, the communities saw projects as essential to developing their own capacities. Even though the return on investment for the projects would not meet standard investment criteria, it made sense for other reasons. For Indigenous nations in these case studies, it was about becoming more self-sufficient. Even then, for all the projects, the reasons behind developing their projects filter down to financial support of community programming, hence more programs and services for First Nations.

Despite difficulties with acquiring the funding and grants, interviewees agreed that government has a role in finance and public support: “Government plays a key role, absolutely. Without government, it wouldn't happen but at the same time it's not an easy process” (community interviewee #2). They emphasized that the work with the federal government was more straightforward and within predictable time frames, compared with the provincial government. However, as interviewees noted, some of the funding was provided by the federal government but paid through the province. And since Saskatchewan is limited to one power purchaser, interviewees argued that “SaskPower held more power, and acted as a customer, not as purchaser” (community interviewee #4). Community interviewees felt like they could not make better returns for their communities, as there is gatekeeping. Government creates processes where First Nations would be excluded from pursuing some of those opportunities to begin with. They emphasized that the government needs to think about reasons other than just the cost in developing renewable energy projects. They see that SaskPower policy started creating opportunities for Indigenous people, but they need the provincial government to take a leadership role.

Thus, the financial issues are directly connected to the other capacity challenge, human capacity:

Government can be their own worst enemy ... they come up with various grant funding opportunities that are well intentioned, but quite often the community doesn't have the bench strength ... to apply for these grants or administer these grants (community interviewee #2)

In the Fort Chipewyan case, the process was perceived to be onerous even though their industry partner was responsible for the application: "when you have industry experts [ATCO] that are challenged by some of the bottlenecks of government as well, I don't know how any individual community could be successful in getting millions of dollars in funding for such projects, despite their best intentions" (community interviewee #2). Once successful, the nation found that the government wanted to deal with its industry partner and not with the community:

There was a collaborative approach but ... NRCan wanted ATCO to administer the bank accounts, process payments for a project that was supposed to be Indigenous. So, we had to go back and lobby the government to allow us to actually oversee the funds ... (community interviewee #2)

The power differential in decision making is aggravated by the heterogeneity of the Indigenous communities. A community project leader pointed out that "people within the communities have very different perspectives ... so often government and media ... they kind of look at it as a blob of the same and they fail to recognize the complexity" (community interviewee #3). For instance, in the Tazi Twé project there were at least three factions within the community: those whose overriding concern is protection of the environment, those who want business development driven by financial interests, and those driven by personal political interests. The latter maintain the middle-ground position when it comes to new projects as it would most likely affect who might vote for them. Some advocates of development argued that they have to understand and accept the politics of their communities:

Others maintained that successful projects are a result of strong leadership backed by the community. Thus, in the Tazi Twé case, the respondents argued that "the leadership was standing on the sideline ... and 'yes' side won ... had the leadership truly been leaders and taking a stand? Maybe that would have been different, maybe the majority would have been stronger"; "The project would have

gone ahead, had not the economic conditions changed, but it was a struggle all the way through because there was no consensus in the community or the leadership" (community interviewee #3).

Another division in a community can be generational. As a community respondent pointed out, Elders generally were not supportive for a number of reasons: "afraid of change; hoping to go back to the old ways; stressing independence; wondering why they couldn't bring a diesel generator back in to generate power; concerned about the land and the impact on the environment" (community interviewee #3). However, even within Elders there is a split between those focusing on the future and those wanting to go back to the past:

Some saw this as a future for the children, the profits generated from this project would have made a fundamental change in the community. Over time, the community could have become financially independent. It would have provided employment opportunities and training. The young people, particularly the males, were supportive because they wanted jobs, particularly through the construction ... to obtain skills and income. (community interviewee #3)

There was also a group that preferred not to be involved or were indifferent to any project development.

5.3 Energy Projects Continue to be Framed within Indigenous World Views

Community interviews revealed that in developing innovative technology projects like renewable energy, there is an alignment with Indigenous world views and the concept of a cycle and circularity: "First of all, I think, what you have to consider is [the] First Nations world view. First Nations consider Mother Earth the most important thing because everything we get, we get from Mother Earth for use, benefit, and survival" (community interviewee #5). Using sun, wind, and geothermal energy is believed to have minimal effect on the land and, therefore, does not damage the cycle and circularity of life: "So, it fits in with our world view to develop these natural resources: sun, wind, geothermal, but that's so expensive to develop geothermal. Wind and sun, we think we will always have, at least we hope we will. So, why not utilize as best we can and more than fossil fuels so [we don't] pollute Mother Earth" (community interviewee #5). For Meadow Lake Tribal Council the goal of the biomass project is for the community to "become more self-sustaining, generate more revenue, and then better fund programs and services ... there's also the goal of clean energy and not wasting"; "And it creates employment as well" (community interviewee #4). Underlining this is the traditional teaching that "not one piece of the tree should go to waste, everything should be used" (community interviewee #4). For most

of the case study communities, the broader objectives of the renewable energy projects align with their Indigenous world view and concepts. For example, Cree Peoples have the concept of *pimachesowin*, an “ability to make a good living,” which is similar to the Anishinaabe Peoples’ concept of *bimaadiziwin*, the “Good Life,” and *ayii yorege* “teachings of good spirits,” in my Sakha/Yakut Peoples’ culture. The concept of “making a good living” unites the idea of the land, good conduct, and self-sufficiency, which includes values such as self-worth, dignity, and independence that are essential to a community’s or a nation’s security. This concept is especially relevant today in the context of the threat of environmental and technological disasters. In this context, the concept of “making a good living” has an importance for Indigenous Peoples in the rebuilding of the communities and in decolonization (Iakovleva, 2022).

These priorities of communities are not the main reason for industry and government seeking partnerships. They are oftentimes driven by the incentives of economic benefits and, recently, addressing climate change. However, climate change is linked to sustainability, which presumably has different meanings for communities and industry/government. Therefore, learning the government and industry perspective will help to understand their position when it comes to building clean energy projects in northern, remote, and Indigenous communities, which will then help to reveal whether there is an alignment or discrepancy in the perspectives of Indigenous communities and those of government/industry.

6. Key Themes from Industry and Government Interviews and Lessons for SMR Development

This section provides insights from the interviews with government/industry (including Crown corporations, and public and private companies in the energy industry), as well as from the community interviews on potential SMR development. While SMRs are not currently under consideration, the general sentiment of community respondents is neutral.

There’s been little or no discussion on what communities think of SMRs as far as environmental issues ... But as far as an opportunity for a community that feels they’re comfortable with it produce electricity and heat, district heating system, it’s probably a tremendously smart idea. With these new, safer microgeneration systems, the one that generates 5 MW, you’re able to do just like we did with the biomass; the federal government, they have to get off a diesel grant program out there right now... (community interviewee #1)

Community acceptance is another big challenge with any type of new project: “if you’re talking about nuclear, time will tell ... to be honest with you, it was challenging enough to get community buy-in for a solar project”; “Swaying public opinion in a small community, it would be very challenging to say the least, not impossible but challenging”; the “Alberta government is hoping to [get SMRs] in the oil sands, and maybe further into the north but you need to consult; you need buy-in from the locals ...” (community interviewee #2).

Ironically, SMRs are not considered feasible for power production in Saskatchewan’s uranium mines, which are currently powered by hydroelectricity on the northern grid: “in the north, that would be [the] absolute last place they would put a small nuclear reactor”; “Uranium mines buy power at cheap cost, locked in agreements for multi years” (community interviewee #3).

The concern over waste is still one of the main issues, however, and a community leader hoped that a solution to the current practice of storing spent fuel on-site could be found:

I’ve got a little bit of mixed feelings on nuclear energy ... personally, I’m on the fence a little. The biggest story is the waste ... I know that tremendous potential it has. There’s got to be a way that modern technology can deal with it that’s going to be sustainable into the future ... (community interviewee #5)

The overarching theme that the government/industry interviewees see around the work with communities in the development of SMRs and other clean energy projects, is relationship building—inviting the communities to talk and listening to them as a way to amend past relationships and actions. Thematic analysis demonstrated that governments cannot always control the dynamic, however; as the sustainability transitions lessons for SMR development demonstrated, it is still a political strategy to argue for empowering the niche, in this case the SMR niche (Iakovleva et al., 2021). Governments and industry do make an effort, but this is done, as Smith and Raven (2012) put it, in a way that presents “important change processes as resting in actors strategically re-telling the past to make new sense of the present and envision alternative futures” (Smith & Raven, 2012). This is clearly uncovered in the industry/government interviews.

We’ve all learned over the years that it does have to be a partnering and a two-way conversation; it can’t be ‘this is what we’re trying to do’. And that’s one of the things that we’ve heard about is that don’t come with what you plan to do, come with ‘this is what we’re interested in doing’ and listen ... (industry interviewee #1)

As such, actors in the government and industry see the development of SMRs as a window of opportunity to amend the relationships damaged in the past with larger nuclear plants. “It is a matter of understanding where the relationship exists today, what is the history of the relationship, and being very respectful of legacy issues” (industry interviewee #2). Both federal and provincial governments as well as electricity utilities have difficult legacies with Indigenous communities in Canada in developing any type of energy projects. They base their understanding of the need to build new relationships on the lessons of the past and in alignment with the Truth and Reconciliation Commission of Canada (TRC) and Calls to Action:

we’re trying to make sure that we’re not moving too quickly, that we [don’t] blow by those communities, the broad public and Indigenous people in the province, right? And so, it’s a journey that we’re going to take together, and you just try to be very respectful of every situation, and what the history and legacy is (industry interviewee #2).

These statements reveal the difference between Indigenous/community and industry/government perspectives in understanding the matter of timing. It is impossible to say how long it will take to build trust and reconcile relations with Indigenous nations, but for government and industry it is just an objective like any other and put in the time frame of what will work for the project. As such, government/industry plan for relationship-building with communities to take as long as the project's development, while Indigenous nations perceive that this will take a longer time. Reconciliation is a long process that may take decades and longer.

This is not to say that the communities in the case studies deliberately drew out the process. In fact, the reverse is true because the consequences of failure were so much greater for the communities. The project failure represented the community’s lack of decision-making power, which didn’t affect the industry to the same extent. The governments and industry fail to understand the power differential, and that engagement with communities does not grant decision-making power to the communities:

the thing about investing in a nuclear power plant or a hydroelectric dam is you’re asking folks today to make an 80-year decision ... somebody had to have the courage 60 years ago to make that capital decision and to get the community support, and then generations just benefited from it. (industry interviewee #3)

This informs how government/industry holds the perspective of giving the communities a choice by providing all the benefits of clean energy, such as SMRs, and then expecting the communities to make a decision and accept the technology. They see it as the way of being welcoming, acknowledging the lack of answers and providing information for communities to decide: “if they were presented clear, evidence-based options, I don’t see how all of them would say no” (intermediary interviewee #4).

And so, I think it’s on us, right? Like, Indigenous communities know what they want, they know what they’re doing, they know what their priorities are, they are the experts in their own lives and history. And if we forget that or ignore that, we’re going to blow up our own projects, right? (industry interviewee #5)

the key is to invite communities, welcome them to learn, but not ordering them to learn, if you can see the difference. (Industry interviewee #6)

However, these government/industry actions create a one-dimensional approach where the provision of information and options for communities, without realizing the power differential, creates predisposed inequality. Thus, even informing communities of options and providing the necessary information does not fulfill the requirements of meaningful engagement with communities. Nevertheless, that does not mean that government/industry actors do not make steps towards meaningful engagement. There are authentic attempts towards building trust and relationships with communities by open and frequent communication and collaborative work: “I think we often forget that, we forget the human element of building trust and building relationships. And that is something that I think policy makers can’t afford to forget” (industry interviewee #5).

The government/industry respondents expressed a will to approach communities in a meaningful way, but from the interviews at large it seemed there was a lack of unanimity and understanding of where to start in approaching the communities. On this point, the community interviewees pointed out that an Indigenous advisor or specialist in a utility organization or government usually carries the largest share of the responsibilities in working on building trust and relationships with Indigenous communities.

Among the actions that the government/industry takes as meaningful engagement and empowerment approaches is the idea of providing equity participation to Indigenous groups in SMR projects. There is no clear picture among the interviewees on the process, but it is, again, based on changing the way things were done in the past. The interviewees admit that historically

Indigenous communities had not been part of the equation and that needs to change: “Indigenous people are rights holders, but they’re to me, they’re number one on the list of influencers. And they have to be brought along, and this is an opportunity for them to be involved from the ground up in a new industry being developed” (intermediary interviewee #9).

Other actions include attempts to legitimize the work towards Indigenous engagement. The first includes organizational policy documents such as, for example, Ontario Power Generation’s Reconciliation Action Plan: “it’s got some real metrics on there. So, this is not just words, this basically says we’re going to spend X dollars in the next 10 years with Indigenous companies and committing to us, and we’re measuring our performance against that, we’ll continue to measure performance and publicly convey whether we achieved those goals that we set out” (industry interviewee #7).

The second legitimization attempt is the work with intermediaries, and the third legitimization attempt is community agreements. These actions are a step forward towards actual steps in building a meaningful engagement process with communities.

7. Discussion

Governments, both federal and provincial, have decision-making power when it comes to any energy project development in northern, remote, and Indigenous communities. Electrical utility companies may also have a role, especially if they are private corporations. The previous sections of this article show that government and industry have the power to walk away from new projects anytime, as in the Tazi Twé case study, while communities are more dependent on government and industry. The system is set up so that organizational barriers are created for Indigenous nations in funding, regulation, and overall project development.

Although most projects are 100% Indigenous owned, the case studies reveal the complexity of the federal funding distribution system and the power imbalance it creates. An economic development agency, or similar type of organization, generally takes the lead in project management, but the governance arrangements are set up so that the federal government does not release funds directly to economic development authorities but to First Nations, which distribute the funds back to their economic development arms. In the Meadow Lake case study, the process was even more complicated, where they had to create a separate non-for-profit company in order to receive funding from the federal government.

Another barrier is non-transparency and the discretion in federal and provincial funding decisions. The case study projects show that First Nations were almost never successful in getting the amount requested in funding applications.

This is a special problem for First Nations as they are limited in options to make up for those shortfalls. In comparison with private corporations that can make up for shortfalls with external investments, First Nations encounter difficulty raising financing for the projects to begin with, and then recouping the investment if they succeed in getting it. This creates a lack of trust from Indigenous nations when it comes to even start developing innovative energy projects that also do not come with roadmaps.

Communities experience a lack of information in how and where to begin with the innovative technology development process, and they emphasize a lack of awareness of other communities’ experiences. They argue that there is no guide or playbook in terms of where to start. The necessity of roadmaps is clear from the broader lessons of the transitions literature (Iakovleva et al., 2021). But interviews revealed that the government/industry action plans have not been fully integrated, including the part on community engagement. There are some attempts to create local roadmaps; for example, Ontario Power Generation and Athabasca Chipewyan First Nation came up with the Reconciliation Action Plan and the Community Energy Plan respectively. However, there’s no comprehensive plan that represents both government/industry and community guidelines towards the development of clean energy technology. Even though government and industry interviewees voice the need for a streamlined process in the energy development process, overall they seem to have a unilateral understanding of where to start with community engagement, mostly founding their actions on narratives of building trust and relationships as a way of amending past actions. However, the relationship between government and industry or a utility can also be nuanced, for example, in the way that the provincial government can play a role directing a Crown corporation, which is different from a private organization. While private organizations would need to be involved and held accountable for the decision-making, Crown corporations are a part of the government and therefore if a project fails, governments can place responsibility on the Crown corporation; and if a project succeeds, governments can take all the credit. Overall, governments arguably see conducting business with Indigenous nations in energy projects as a risky venture.

Most communities have no prior relationship with Crown corporations on any energy projects. Therefore, communities also voice the need for a streamlined process both in funding and regulation, as well as a proactive role for the federal and provincial governments for policy decisions that support that process. As such, community interviewees emphasize the need for creation of a “space.” The concept of space in this context entails several meanings. On the one hand, it is similar to the idea of “safe space,” Indigenous space, that can take the form of formal and informal networks. Formal networks could be an institutionalized

space that potentially includes funding opportunities, such as procurement opportunities, access to private capital, funding platforms to build on, and so on; policy tools to have more decision-making power, such as expedited regulation for community projects, community decisions on technology options, and so on; and infrastructure development plans and others. Informal networks could be a non-institutionalized space where communities connect, learning from each other and approaching industry and government where they also get information on processes around project development and training (Rhodes, 2006).

On the other hand, the idea of space can be thought of in the sense of space creating time. This sense of space means that communities can take time to examine more and make an informed decision about project development. So, in addition to safe space, this relates to the space created through the results of government/industry actions. Overall, that is what the engagement process includes. However, industry/government see the engagement process only from the regulatory lens where in fact what is needed is time to engage with communities beyond legal processes and create space for a dialogue and a long-term reciprocal engagement process. Another issue is the question of a degree of institutionalization where government/industry work within the space of formal networks rather than informal, therefore running a risk of the space becoming institutionalized when it does not necessarily have to take that path. This contrasts with the traditional idea of institutional arrangement and aligns with the Indigenous world view of space, where informal networks can act as non-formalized spaces where nations reciprocate and build relationships. By creating that space, government and industry's role is to enable possibilities for communities to explore so that communities will not miss opportunities as in the past.

So, there is a role for intermediaries in helping to create and manage the space where it is possible to find ways to align the perspectives of government/industry and communities. From the sustainability transitions multi-level perspective, intermediaries can create a shift in a socio-technical regime (El Bilali, 2019; Geels, 2011; Markard & Truffer, 2008). In our previous article (Iakovleva & Rayner, 2023), intermediaries were studied from the lens of enabling technology adoption or “bridging the ‘valley of death’ between R&D and market introduction” (Schot & Geels, 2008, p. 538), where we found that intermediaries act as policy entrepreneurs, i.e., “actors who engage in collaborative efforts in and around government to promote policy innovations” (Mintrom, 2019, p. 319). Most vendor and utility interviewees mentioned the First Nations Power Authority as an organization they work with to build meaningful engagement with Indigenous communities. They argue that they have a collaborative relationship, where the FNPA helps to understand Indigenous issues and vendors help FNPA understand the technology, what's involved with the process of licensing, construction, and

operation. They point out that it's not a systematic approach yet. FNPA represents an organization that government and industry understand. It is a formal institution with clearly organized structure, therefore, “easy” to work with compared to First Nations and their organizational systems. However, FNPA is an Indigenous organization that also works to support First Nations, therefore it acts as a policy broker. This research reveals that Indigenous-based intermediaries have a vision that is different from a non-Indigenous intermediary. Both are driven by the common goal of a sustainable future, but they have a different understanding of the process and outcomes. Indigenous-based intermediaries have a role in creating a space that can operate through both formal and informal networks: formal institutionalized space and informal non-institutionalized space.

Therefore, intermediaries play an important role but the precise type and role of successful intermediaries is, as the innovation literature concedes, context dependent (Iakovleva & Rayner, 2023; Iakovleva et al., 2021). Communities have had intermediaries involved in the process. The case studies demonstrate that for the projects to be successful, the communities need to be the decision makers on the project; however, providing decision making is not enough, they also need space. There is still a role for an intermediary chosen by the community (for example, FNPA or Greenplanet Energy Analytics). In the case of Fort Chipewyan, the Greenplanet Energy Analytics company, was hired by 3NE to build and manage the project. In Meadow Lake, the project was contingent on biomass that has been developing in the area for decades. With the leadership of the community and the help of the intermediary FNPA, they strengthened their work in the development of the biomass project. Muskoday First Nation worked closely with FNPA, which helped the First Nation to recognize potential in SaskPower's call for proposals to build solar projects in Indigenous communities. The Black Lake First Nation needed support from an intermediary, which would have helped them build their case and work with SaskPower.

The role of FNPA is seen as lobbying on behalf of First Nations, where the nations acting individually were unsuccessful or inactive. Additionally, FNPA stands as a consulting agency when nations need assistance with administrative processes and other organizational barriers. FNPA could be seen as an incumbent-oriented intermediary (e.g., centrally considers interests of the established government) since it is mostly funded by the federal government and a Crown corporation; however, from the community projects' perspective, FNPA can provide support in creating that space of formal and informal networks. FNPA acts as a policy broker in creating the space for Indigenous nations.

Indigenous nations need a space where they can be present outside of just an Indigenous Relations' team. As the interviews reveal, Crown corporations have an Indigenous Relations team that mostly works with Indigenous communities on

energy projects and that could be limiting. A corporation's Indigenous Relations team has to cover many grounds, spanning over different areas and technologies. The breadth of responsibilities means that specialists need to be a "jack of all trades," which creates a shortage of more thorough work with communities. Therefore, this calls for skilled specialists on the capacity and management side, and that is where training is needed, in particular training in transferable skills. The education system provides specialists that can take on specific professions but, as the case study interviewees emphasize, there is need for project management and evaluation skills for energy technology development in Indigenous areas.

Project management plays a great role in success or failure. The case study projects reveal similarities in governance structures. For the Muskoday First Nation solar project, Meadow Lake Tribal Council biomass project, and Tazi Twé hydro project, an economic development arm played an important role as the project lead, while the Fort Chipewyan solar farm involved a collaboration of three First Nations and they hired a company to manage the project. If First Nations or a Tribal Council develop projects independently, as in the Muskoday, Meadow Lake, and Black Lake projects, they normally develop and manage projects through economic development agencies. If two or more nations develop projects together in collaboration, like the Fort Chipewyan project, they might do the same through their respective economic development agencies, or they may create a separate organization to oversee the project, in this case 3NE, and hire an agency for management. Therefore, it is critical to find the governance structure that fits the requirements of each First Nation and community. Fort Chipewyan is one of the most successful among the case study projects, which demonstrates that an energy co-operative is among the most efficient structures, where every party can benefit if the project succeeds.

As we can see, intermediaries creating space and capacity building are important factors in innovative technology adoption. Communities emphasize that Indigenous nations need to make the decisions, but the federal and provincial governments play an important role in initiating the change for those decisions.

8. Policy Recommendations

Based on the interviews with government/industry and community representatives, I identify the following policy recommendations or good practices for sustainable innovative technology adoption in northern and Indigenous areas, which are potentially applicable to future development of small modular nuclear reactors (SMRs). These recommendations are driven by the perspectives of Indigenous communities in northern Saskatchewan and Alberta regarding their experiences with the development of renewable energy projects, but the recommendations include a broader narrative of clean energy technology

development. Learning from the existing experience and knowledge of northern Indigenous communities regarding renewables as a clean energy source provides advantages both for industries developing the technology, as well as for other communities—so that they have a comprehensive understanding and can make informed decisions on the development of clean energy, and potentially SMR projects. The federal government, utility companies, and SMR vendors argue that nuclear energy will play a key role in meeting Canada's net-zero goals, in particular, SMRs (GE Hitachi Nuclear Energy, 2021; SaskPower, n.d.). However, large reactors are less relevant for northern, remote, Indigenous communities, except for mining site applications, and currently there is no development of SMRs in the communities. However, there are other projects, such as renewable energy projects, with lessons that can be applied to SMRs. With mining as the most probable application for SMRs, there is an issue of proximity to communities, and the possibility that community perspectives might misalign with the industry perspective on SMR projects' development. Developing innovative technology projects that include a community governance perspective will help advance the energy transition not only in accordance with the development goals of industry and government but, more importantly, with those of Indigenous communities and pursuant to reconciliation with Indigenous Peoples.

It is important to note that Indigenous communities are not homogenous. Each community has a unique history, knowledge, experience, culture, and people. So it is essential for project developers to not generalize communities, and to approach each one individually with a focus on local priorities in order to build meaningful relationships and develop a shared vision.

Communities are not only different from each other, but there is not necessarily homogeneity within communities. There may be different groups, political interests, and Elders within nations who support or oppose the same project. The governance systems of Indigenous nations are complex and different from Western systems. Socio-cultural practices are deeply embedded and drive governance systems and community operations. As such, there is a special role for Elders and Knowledge Keepers whose voices are as important in decision making as the voices of Chiefs and Councils. Traditional forms of governance exist alongside the colonial structures. So, it is important to remember the uniqueness of the communities, and to avoid deepening any divisions within communities with policies that may not be appropriate.

Hence, creating a space in the form of formal and informal networks that will benefit communities is important. The case studies reveal that First Nations' experiences are exacerbated by the history of complicated relationships with governments and Crown corporations—this history makes many First Nations hesitant to engage with a potential project if they do not receive financial and/

or administrative assistance. Therefore, building a community business portfolio and regaining confidence will require space, even more so when developing a potentially contentious niche technology such as SMR.

Create Space in the Form of Formal and Informal Networks

There are a number of approaches to creating space. The formal network that I propose includes a general partnership of Indigenous owners in the form of co-operatives that can help develop projects and increase Indigenous participation as equal partners in the energy sector. When it comes to developing innovative technology, the form of ownership and cooperation that aligns with Indigenous-based concepts of reciprocity and connection, as in the case of Three Nations Energy, proves to be efficient. 3NE is in the process of diversifying its economic portfolio by investing in a large \$145 million portfolio of solar farms in southern Alberta. In building that structure, the initial step should be for the federal and/or provincial governments to create policy that creates opportunities and provides economic guarantees with equity partnerships for Indigenous nations. Industry and government seeking to develop clean energy technology, and especially SMRs, need to discuss equity arrangements with those Indigenous nations impacted by the projects but, most importantly, Indigenous nations need to come up with the arrangements and the amount of equity themselves.

Let Communities Decide on Space Arrangements

In creating space, co-creation, co-governance, and co-development are important constituents of the relationship between government/industry and Indigenous nations. Remedying the power imbalance is of utmost importance. Governments need to recognize the levels of Indigenous governments and to not interfere while delimiting their control in regulatory and policy arrangements. Based on that, Indigenous nations can create their own arrangements. This research reveals a gap between Indigenous communities and industry/government in understanding and perceiving the terms space and time. Building trust and relationships in order to work with and reconcile relations with Indigenous communities takes a long time, but for government and industry this is placed in the time frame of what will work for the project, while for Indigenous nations it is perceived as a long-term continuous process. Another aspect is that “time” as an embodiment of the concept of “space” can benefit the communities in the development of new projects, along with formal space (project that has a space is not tied to the timeline of the government and industry but led by the community). Streamlining the process is seen as beneficial for both sides. We need to listen to what communities say about streamlining the process. First, governments need to create a clear, transparent process of support for the community project’s development. Second, communities

can streamline the process of forming community energy plans by educating people as to the possibilities for the community, and advancing the community’s energy priorities. This needs to be substantiated with the help of specialists to conduct training in project management and helping to build local employment.

Include Intermediaries Chosen by the Community

An important discrepancy between government/industry and communities is their different definitions of successful intermediation. For government/industry successful intermediation is more individualistic, requiring the effective adoption of knowledge-based practices through which internal value (financial and non-financial) is generated (De Silva et al., 2018). For communities, however, successful intermediation means taking into consideration community values and perspectives in making an informed decision. In creating that space, Indigenous nations require assistance from intermediaries who are chosen by the community. An intermediary’s role is being a trustee for both sides, but advocating and advancing the community perspective and building space (formal and informal networks) for energy project development. For example, the First Nations Power Authority (FNPA), headquartered in Regina, Saskatchewan, is such an organization; or it could be another organization that acts as a policy broker. FNPA is an example of an intermediary that has an independent position where it stays open-minded and unbiased towards either of the sides and creates space of its own. For government and industry, the intermediary’s role is to help them understand communities, and to contribute to industry and government having an authentic and meaningful engagement with Indigenous nations.

Align with Truth and Reconciliation Commission Calls to Action

In accordance with the Truth and Reconciliation Commission of Canada’s Calls to Action (TRC, 2015), the goals I strive to reach in these recommendations include governments, industry, and project developers committing to meaningful consultation; building respectful relationships; obtaining the free, prior, and informed consent of Indigenous Peoples before proceeding with economic development projects; and ensuring that Indigenous communities gain long-term sustainable benefits from economic development projects. Therefore, good practices should be community-based, and community-driven by intermediaries to create that space where Indigenous communities are informed, educated, and empowered.

9. Conclusion

This article has discussed innovative energy technology development in remote, Indigenous communities in northern Saskatchewan and Alberta, and the alignment or discrepancy between the perspectives of communities and those of governments and industry regarding innovative technology adoption. This research shows that there is no clear direction for industry and government in understanding Indigenous perspectives on energy security and sustainability with respect to clean energy technologies.

Both parties stress the importance of intermediaries in bringing about change, but they think of their roles differently. Industry and government see the process as a linear path to material abundance and individual achievement, where actors are enablers of the energy transition in the socio-technical space. This view is based on the ideas of innovation development from the sustainability transitions perspective. Indigenous communities have a different, unique perspective of an integrated sustainability transition where change agents create a space that helps to align and connect the community and industry and government needs.

As such, the findings show that while current global policy actions in sustainability transitions are significantly driven by the climate emergency, Indigenous nations' development of clean energy projects, though recognizing the climate emergency and experiencing its effects, are driven by concerns about energy security. Communities in northern Saskatchewan and Alberta are in a position where their energy transition is taking place while they are still managing poverty and creating economic development opportunities. And these challenges are exacerbated by the heterogeneity between and within Indigenous communities.

For this research, I focused on the socio-technical regime in the context of sustainability transitions. During interviews, representatives of northern communities expressed frustration with the socio-technical regime and called for a different approach to developing innovative energy technology for Indigenous nations. The approach is based on an Indigenous world view of technology development grounded in connection to the land and circularity of life and nature processes (i.e., leaving no waste), as well as a desire to pursue economic development, ownership, and self-sufficiency. The results show that from the multi-level perspective there is a need for a governance approach that expands the limits of the local network within the niche where communities can influence the institutionalized regime (International Science Council, 2019). Therefore, community-driven intermediaries play an important role where they can create the space that links niche and regime with a scope that is outside of a traditional understanding of the socio-technical niche. Currently, the government and

industry approach to understanding engagement with Indigenous communities, and the ways it should be conducted, is limited to the conventional niche-regime interaction level.

The recommendations of this article are intended to apply to any technology, including SMRs. However, SMRs are a more complex technology than renewable energy, so it is hard to predict their relevance in northern, remote, and Indigenous applications. For SMRs to be implemented at a commercial scale, they need to gain community acceptance so that they can compete at the same level as renewables. This can only be achieved if government and industry work towards resolving the misalignment of their perspectives with those of Indigenous communities.

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